Exploring the Most Effective Interventions for Children with Autism Spectrum Disorder

By
Madison S. Clary

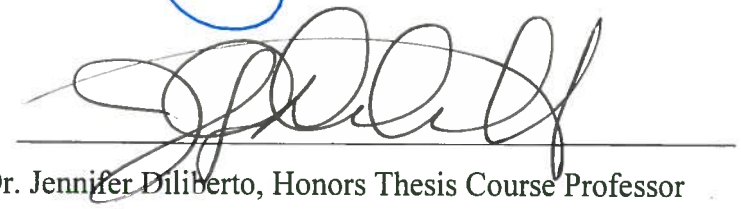
Senior Honors Thesis
School of Education
University of North Carolina at Chapel Hill

November 4, 2019

Approved by:

Dr. Sandra Evarrs, Honors Thesis Advisor

Dr. Carol W. Jordan, Honors Thesis Second Reader



Dr. Jennifer Diliberto, Honors Thesis Course Professor

Abstract

Intervention for students with Autism Spectrum Disorder (ASD) in public schools is a key to unlocking the potential of young students. Evidence-based practice is used in a variety of differing ways to provide the best intervention. The purpose of this paper is to conduct a literature review on the current literature of communication interventions for early education students with autism spectrum disorder and determine what makes these treatments effective. Six intervention methods were chosen to be focused on in this literature review: (a) TEACCH, (b) Visual Schedules, (c) ABA, (d) Augmentative and Alternative Communication, (e) Verbal Behavior Therapy, and (f) Social Skills. A literature review of 19 studies was conducted to answer the research questions in the current review. All 19 of the studies included the analysis of one of the listed intervention methods. The literature review revealed that there are two key factors in ensuring success in ASD intervention in public schools: consistency and opportunity. Providing consistency across the environments of the student and opportunity for appropriate intervention sets up a prospect for success. While there were a number of limitations in the current literature review, the gathered data should still be interpreted. Moving into future research, more research needs to take place directly in the public school setting as this is such an important place for school-age children with ASD.

Keywords: autism spectrum disorder, intervention, public school, speech-language pathologist

Table of Contents

Chapter 1: Introduction

The United States Centers for Disease Control and Prevention (CDC) released a study in 2018 that reported one in 59 children will be diagnosed with Autism Spectrum Disorder. This prevalence rate displays a 15 percent increase from the prevalence rates previously reported in 2016. This increase in the number of children affected by autism means an increase in the number of students with autism the public school setting. In response to the growing population, public schools must accommodate for the increase in the number of children qualifying for Individualized Education Plans (IEPs) being implemented in their system. Public schools are the primary setting that these children receive not only their education but also therapies, 1:1 training, and social skills. Each incoming student presents with a unique set of educational needs from the last. It takes preparation and readiness from all professionals involved to provide the best possible plan for each student that enters the public school system. Fewer than 10% of school-based treatment programs for children with autism are classified as evidence-based practice (EBP) (Hess, 2007). In order to provide the best plan of care, in an IEP, to the students that are reliant on the system, the school system needs to implement evidence-based practice for their students' with autism.

This thesis will contain a literature review of six EBP for students with ASD. The thesis is organized by five chapters: introduction, methodology, literature review, results, and discussion. The chapters begin with an explanation of the topic in the introduction section. Methodology then explains the process of finding literature that relates to the current subject of ASD interventions. The literature review section provides an in-depth investigation into articles that will then contribute to the results and discussion sections.

What is Autism Spectrum Disorder?

The American Psychiatric Association's Diagnostic and Statistical Manual, Fifth Edition (DSM-5) is the criteria that is followed to assess and diagnose for Autism Spectrum Disorder. The DSM-5 follows the following diagnostic criteria when diagnosing for ASD:

1. Persistent deficits in social communication and social interaction across multiple contexts
2. Restricted, repetitive patterns of behavior, interests, or activities
3. Symptoms must be present in the early developmental period (but may not become fully manifest until social demands exceed limited capacities, or may be masked by learned strategies in later life).
4. Symptoms cause clinically significant impairment in social, occupational, or other important areas of current functioning.
5. These disturbances are not better explained by intellectual disability (intellectual developmental disorder) or global developmental delay. Intellectual disability and autism spectrum disorder frequently co-occur; to make comorbid diagnoses of autism spectrum disorder and intellectual disability, social communication should be below that expected for general developmental level.

The current literature review aimed to understand communication deficits faced by students with autism and research specific evidence-based practices often used by a speech-language pathologies in a public school. The purpose of this paper is to conduct a literature review on the current literature of communication interventions for early education students with autism spectrum disorder and determine what makes these treatments effective. The following research questions will be addressed:

1) What are the most common communication deficits in students with ASD?

2) Which EBPs are most effective in advancing communication in students with ASD?

Language Delay in Autism

The American Speech-Language Hearing Association (ASHA) provides information on the language delay observed in individuals diagnosed with ASD. ASHA states that, "Social communication deficits include impairments in aspects of joint attention and social reciprocity, as well as challenges in the use of verbal and nonverbal communicative behaviors for social interaction. Restricted, repetitive behaviors, interests, or activities are manifested by stereotyped, repetitive speech, motor movement, or use of objects; inflexible adherence to routines; restricted interests; and hyper- and/or hypo-sensitivity to sensory input."

Each of these communication difficulties manifest in a variety of ways. Communication impairments observed in autism spectrum disorder are a defining feature, as stated by ASHA. While autism presents differently in every individual, so do the communication barriers faced by that individual. All different ranges of needs and abilities are addressed by a speech-language pathologist.

The Role of a Speech-Language Pathologist in the Schools

As described by the American Speech-Language-Hearing Association, "Speech-language pathologists (SLPs) work to prevent, assess, diagnose, and treat speech, language, social communication, cognitive-communication, and swallowing disorders in children and adults." For the purposes of this research paper, the main focus will be on the role of an SLP in the public school setting. A speech-language pathologist in the public school setting has many roles. While working with all different ranges of disorders and levels, these SLPs must balance the educational applicability in the everyday lives of the students. Developing an individualized education plan (IEP) to meet the needs of each individual student is one of the responsibilities of

an SLP. In order to choose a treatment plan that will best benefit the child, the SLP must be knowledgeable of all intervention options available specifically those found to be evidence based.

If a communication intervention is needed, the IEP team will work together to determine what the best option for the individual. There are many empirically supported intervention methods available for the multidisciplinary team. The difficulty is determining what intervention methods are most successful for the particular population. For the early education population, the students' position on the spectrum must be taken into account when choosing an intervention. Once the therapist has narrowed down the scope of interventions, they then determine what might work best.

Impact on the Student

The early childhood stage is a critical period for advancement in language. There can be many goals met during this time if the proper plans are put into place. The public school is the setting in which children with autism receive the majority of their services (Locke, 2019). Unfortunately, many of the services received by these students have no empirical base or any historical reference that provides for a promising outlook (Heflin and Simpson, 1998). The result of this is an inefficient use of monetary funding, resources, and time. Furthermore, the impact had on the child will not be as positive as it could have been with proper implementation of EBP early in their development.

A study conducted by Zirkel et al. (2018), assessed the quality of programs for children with autism. This study contributed to the discussion by providing a tangible resource, the APERS, that can assess quality of these programs. Highlighted in this article is the importance of validating the interventions that are being used in public schools. Schools can use this tool to

identify limitations and improve the current program (Zirkel, 2011). The linkage between intervention and evidence based practice must still be met in order to provide the intervention with the most promising outlook.

Interventions

The interventions selected in the current study were chosen due to the work of previous studies and the most commonly used practices in public schools today. In order to be included in the study, an intervention must be commonly used in the school. Ruled out were the interventions that did not have a significant use percentage or did not affect communication goals in the IEP. The interventions chosen for analysis are:

1) Structured Teaching – Treatment and Education of Autistic and Communication Related Handicapped Children (TEACCH)

2) Visual Schedules

3) Applied Behavior Analysis (ABA)

4) Augmentative and Alternative Communication (AAC)

5) Verbal Behavior Therapy (VBT)

6) Social Skills

Table 1 was compiled to compare these six intervention methods. Hess et al. determined the percentage use of the following therapies through a survey distributed to teachers in public schools. This information was combined with a description of key points in the intervention methods and professionals involved in the service.

Table 1

Interventions Focused on in this Literature Review

Intervention	Percentage Use	Key Intervention Focus	Professionals Involved
Structured Teaching (TEACCH)	8.11	Physical organization, Individualized schedules, Work (Activity) systems, Visual structure of materials in tasks and activities	Special education teachers, Residential care providers, Psychologists, Social workers, Speech therapists
Visual Schedules	8.65	Visual strengths, Increasing Independence	Occupational therapists, behavioral therapists, speech therapists, school psychologists, general education teachers, health and PE teachers, many other direct care staff
ABA	32*	Behavior and reinforcement: 1. Antecedent 2. Behavior 3. Consequences	Board-certified behavior analyst (BCBA) provides ABA therapy services.
AAC	2.7	Communication, speech, social development	Speech-language pathologist
VBT	5.95	Language, requests, connecting words	Psychologist, Behavior specialist (BCBA), Special education teacher, Speech and language pathologist
Social Skills/Social Stories	11.89	Enhancing everyday communication, breakdown of social concepts	occupational therapists, behavioral therapists, speech therapists, school psychologists, general education teachers, health/PE teachers, many other direct care staff

Note. Percentage Use: by Hess et al. (2005)
Professionals Involved: by *Autism Speaks*
*As reported by Green et al. 2006

Justification of Research Problem

In a 2007 study, Hess et al. identified the types of treatments, therapies, and interventions that are being used by teachers working with students with ASD in Georgia's public schools. This study provided a quantitative view as to what strategies are being used most by teachers. Strategies that teachers reported using in their classrooms were reported on a scale of: (a) scientifically based, (b) promising practice, (c) limited supporting information, (d) not recommended. Analysis of this coding demonstrated that fewer than one-third of teachers use evidence-based practice in their classrooms. Hess et al. explains that, "Controversial and unsupported treatments plague the field of autism, resulting in wasted time, energy, and funds" (2007). This is relevant to the current study in relation to the importance of implementing evidence based practice. Without implementation of this type of practice, the current study shows illustrates the possible negative effects.

A study from Dr. Anagnostou et al. aimed to evaluate the outcomes of adults with ASD that have been receiving services. An outcome of the study claimed that, "Some improved outcomes may be because of more inclusive and specialized educational programs. The level of verbal communication and IQ before five years of age are the strongest predictors of outcome" (Anagnostou, 2014). This study emphasizes the importance of evidence-based practice at an early age to predict the best outcome in the future. The researchers acknowledge the deficit in matching the best interventions to the child and their family. This is an area that the research team suggests should be worked on in future research.

A study by Stahmer et al. (2005) focused on early intervention practices for children with autism from a viewpoint of the community providers. Highlighted in this article is the fact that not many providers understand evidence-based practice. The most widely used intervention

programs were found to be: picture exchange communication, applied behavioral analysis, discrete trial training, and floor time. This study did not analyze which interventions provided the best outcome. This study reported that, "participants expressed a desire to use methods that have been shown to be effective, they had not analyzed the research base for the programs they used" (Stahmer, 2005).

Purpose

The current literature review aimed to understand communication deficits faced by students with autism and research specific evidence-based practices often used by a speech-language pathologies in a public school. The purpose of this paper was to perform a review on the current literature of communication interventions for early education students with autism spectrum disorder and determine why these treatments are most effective. The following research question will be addressed:

1) Which EBPs are most effective in advancing communication in students with ASD?

2) What makes these EBPs most effective?

Chapter 2: Methodology

The current study is a thorough literature review of journal articles that examine the chosen evidence-based interventions as used in early education for children with autism and administered by the speech-language pathologist. There are six evidence-based interventions that have been chosen for review. Early education will be defined as young children up to the age eight. In this review of the literature, the main focus will lie within the scope of:

1) Structured Teaching (TEACCH)

2) Visual Schedules

3) Applied Behavior Analysis (ABA)

4) Augmentative and Alternative Communication (AAC)

5) Verbal Behavior Therapy (VBT)

6) Social Skills

Scope of Literature

The studies chosen for review were obtained through ASHA Evidence Maps, Google Scholar, PsycINFO, and ERIC.

The following searches were used to obtain the literature used in this review: "Autism Spectrum Disorder+speech therapy", "ASD+TEACCH", "ASD+Visual Schedules", "ASD+ABA", "ASD+AAC", "ASD+VBT", and "ASD+Social Skills Training."

In addition to the literature found through the above searches, references in the found literature were analyzed to provide additional articles.

Inclusion and Exclusion Criteria

Inclusion criteria was emphasized in the current study in order to ensure reliable results. Only peer reviewed studies that were published within the last 15 years (2004-2019) were

included in the current analysis. The reason that this inclusion criteria was chosen was because the main focus of this study was on current trends in the field of intervention. Allowing studies beyond the year 2004 would not provide the most accurate current trends.

Only evidence-based practice interventions were included in the analysis. The reason for this criteria was so that only standard practice was compared. Intervention methods that are not evidence based were excluded from this literature review. Assessing only evidence-based practice is standard care for the helping professionals and a growing trend.

For studies to be included in this review of literature, they must address the topic of Autism Spectrum Disorder interventions in the early education setting. Interventions for other developmental disabilities or in other settings were primarily excluded from the study. There are three studies exempt from this that will be explained below. The main focus of this paper was to focus on efficacy of early education interventions for students with autism. Allowing intervention outcomes from other settings and disabilities would not provide for the most accurate data.

There were six studies included in this literature review that were excused from meeting the above criteria. Three of the studies (D'Elia et al., Chu, and Maich et al.) included participants that had an additional diagnosis other than ASD or no diagnosis at all. Only data gathered from the participants with ASD was used in this literature review. Two studies (Abshirini et al. and Stock et al.) included an additional intervention method other than the one in focus. One study (Orellana et al.) was included despite the fact that it included participants outside of the age range in criteria for the current literature review. For these studies, information that was in the inclusion criteria (i.e. intervention method, age range) was reviewed for this literature review. There was a study (Dillenburger et al., 2012) that included no children as participants; rather,

participants in the study included professionals that are involved in ABA therapy. This study was included for the purpose of evaluating the effectiveness of ABA. These studies were included so that the outcomes of these early education intervention methods could be analyzed to the full extent. Therefore, these studies will be included because they provide contributable context to the results of this literature review.

Changes in Diagnostic Criteria

Over the years covered in the current study, 2004-2019, there have been changes in the autism diagnostic criteria. The latest American Psychiatric Association (APA) publication of the DSM was in 2013. DSM-5 provides a more accurate diagnosis of ASD by removing the four pervasive developmental disorders (PDD) that were outlined in DSM-IV. These disorders included: Asperger's disorder, childhood disintegrative disorder, or the catch-all diagnosis of pervasive developmental disorder (APA, 2013). Under the new criteria, early diagnosis is encouraged rather than school-age diagnosis as presented in DSM-IV. The variations in symptoms are well-represented in the spectrum as defined by the DSM-5 criteria. These changes are important to recognize due to the fact that this change occurred during the course of the years covered in this review of literature.

Analysis Plan

The current literature review, using the strategies defined above, will separate six intervention styles into empirically-supported implications for the speech-language field. These implications will be supported by the 18 studies that have been included the literature review section.

Chapter 3: Literature Review

Autism Spectrum Disorder is classified as a lifelong disorder that affects the individual's ability to communicate and interact with their environment (CDC). The challenges faced by individuals with ASD typically include difficulties in the following categories: (a) communication, (b) sociability, (c) sensory, and (d) health (Shirian et al., 2015). For children in the early intervention age range (up to 8-years-old), the lowest ATEC scores are displayed in the categories of communication and sensory (Shirian et al., 2015). The challenges and range of difficulty differ greatly among each person with ASD. Communication, for example, can be displayed as typical, limited, or absent. Examples of communication challenges include, but are not limited to, the following: (a) delayed speech and language skills, (b) repeat words or phrases (echolalia), (c) reversed pronouns, (d) gives unrelated answers to questions, and (e) talks in a flat, or sing-song voice (CDC). Interventions may be used by a range of service providers to address the given challenges for each individual.

Evidence-Based ASD Interventions

The following literature review contains 19 studies that, together, aim to provide a greater understanding of the effectiveness of intervention methods for children with Autism Spectrum Disorder (ASD). Each of the studies have been assigned to the category of their respective intervention method and ordered in the way in which they were introduced. Then, the six categories of intervention have been distributed into themes within the research.

TEACCH approach to Autism Spectrum Disorder. TEACCH is a program implemented by The University of North Carolina at Chapel Hill intended to provide regional centers that provide services to individuals with Autism Spectrum Disorder. The model was developed by Dr. Eric Schopler in 1972 at the university and, now, has been implemented around

the world. For the purpose of the current literature review, clinical services provided by TEACCH will be the main focus. The program also offers training and consultation for service providers. Clinical services provided through TEACCH include initial referral, consultation, diagnostic evaluation, family consultation sessions, parent support groups, social play, recreation groups, individual counseling for higher-functioning clients, and employment services. TEACCH promotes the following four types of structure: (a) physical, (b) organization and communication, (c) organization of individual tasks, and (d) linking individual tasks into a sequence (Mesibov & Shea, 2009, p. 572). Using this structure, plans are made and implemented to best fit the individual needs of a child with ASD.

TEACCH overview. Mesibov and Shea (2009) observed the TEACCH program as an example of evidence based practice (EBP). In the case, Mesibov and Shea (2009) defined evidence based practice as, "the integration of the best available research and clinical expertise within the context of patient characteristics, culture, values, and preferences" (p. 570). TEACCH is EBP due to the fact that it is based on evidence and observation (Mesibov & Shea, 2009). The research team devotes the successes of the program to the following evidence-based practices: clinical expertise, individualization, real-life measures, and generalizability (Mesibov & Shea, 2009, p.576). Series of studies on TEACCH have been completed to highlight the effectiveness of the program. Literature reviews have also been conducted to, additionally, add to the knowledge regarding the effectiveness of TEACCH. Since its launch in 1972, the TEACCH Program has served over 9,500 clients and families of individuals with ASD (Mesibov & Shea, 2009, p. 576). TEACCH has proven to be an example of EBP in the realm of autism interventions.

TEACCH benefits. D'Elia et al. (2014) conducted a longitudinal study to gain knowledge on the benefits of low intensity TEACCH intervention as observed in preschool aged children with ASD. Low intensity intervention is defined as less than 20 hours of intervention per week for over 2 years. This study consisted of 30 preschool children with ASD or Pervasive Developmental Disorders-Not Otherwise Specified (PDD-NOS) (D'Elia et al., 2014). For the purpose of this literature review, only data reported on children with ASD will be evaluated. Participants were aged 2.0 to 6.11 years and the study was conducted over a period of 24 months (D'Elia et al., 2014). The TEACCH intervention was administered in both the home and school environment. Over the 24-month period, assessments were conducted at: baseline, after 6 months, after 12-15 months, and after 24-months. Parenting stress was an additional factor studied by the research team (D'Elia et al., 2014).

The intervention administered to the children was the low intensity TEACCH program. The program was administered based on an Individualized Education Program (IEP) for each child. Goals were created within the areas of language, emotional control, and self-help (D'Elia et al., 2014). Educators were responsible for carrying out the intervention in the school environment while parents/guardians were responsible for carrying out the program at home (D'Elia et al., 2014). A single therapist worked with the child in both environments to mediate. The control group experienced "usual treatment" that included: psychomotor therapy and speech therapy (D'Elia et al., 2014). These treatments were administered weekly with 2 hours of each type of therapy (D'Elia et al., 2014).

The following evaluation results are listed below in Table 2: Autism Diagnostic Observation Schedule (ADOS), Communication Developmental Inventory (CDI), and Vineland Adaptive Behavior Scales (VABS), and Child Behavior Checklist (CBCL) (D'Elia et al., 2014).

CBCL included categories including, but not limited to: aggressive behavior attention problems, anxiety problems, emotionally reactiveness, and anxious/depressed (D'Elia et al., 2014).

Table 2

Results of Low Intensity TEACCH Intervention

	Experimental Group				Control Group	
Autism Severity	T0	T1	T2	T3	T0	T3
ADOS social interaction	8 (2.6)	7.1 (2.6)	–	6.1 (3.1)	9.1 (3)	7.9 (3)
ADOS communication	5 (2.3)	3.2 (1.4)	–	2.5 (1.1)	4.7 (2.1)	3.9 (1.5)
ADOS total language skills	13 (4.1)	10.2 (3.5)	–	8.1 (4.5	13.7 (4.5)	11.8 (4.3)
CDI comprehension	55 (32)	72 (23)	89 (17)	88 (20)	64 (28)	82 (23)
CDI production	38 (45)	50 (40)	65 (39)	68 (36)	31 (37)	51 (42)
VABS (age equivalent in years)						
Communication	1.4 (0.6)	2.3 (1.2)	2.9 (1.7)	3.6 (2)	1.7 (0.8)	3.1 (1.6)
Daily living	1.9 (0.6)	2.4 (0.6)	3.2 (1.4)	3.7 (0.9)	1.8 (0.5)	3.3 (1.3)
Socialization	1.6 (0.5)	2.1 (0.6)	2.9 (1.1)	3 (1.4)	1.6 (0.8)	2.4 (0.9)
Motor	2.4 (0.8)	3 (0.6)	3.9 (1.2)	4.5 (1)	2.3 (1)	4.1 (1.8)
CBCL Total Problems	60 (6)	56 (6.8)	50 (10.3)	53 (9.1)	62 (10.8)	59 (8)

The control group had lower mean scores were observed for autism severity, shown through the lower mean scores in the EG. Improvement in language skills was noted across both groups, however, notably more significant in the EG (D'Elia et al., 2014). Scores gathered by the VABS proved to be higher in the EG as well (D'Elia et al., 2014). The categories (severity of

autism, language and adaptive functioning) in which significant differences were lacking, provides information regarding moving forward. In the future, the research team suggests that intensity and length must be increased for optimal results (D'Elia et al., 2014).

TEACCH effectiveness. Abshirini, Khafaie, Bahrani, Rayshahri, and Khafaie (2016) conducted an quasi-experimental study to compare the effectiveness of Sensory Integration Therapy (SIT) and TEACCH. For the purpose of this literature review, the focus will remain on the effectiveness of the TEACCH approach. Sixty participants were obtained from an autism center in Bushehr city, Iran (Abshirini et al., 2016). The participants were aged 3 to 9 and all had been diagnosed with ASD (Abshirini et al., 2016). SIT and TEACCH were administered for a 6-month period for the experimental group and the control group received no intervention during the 6-month period (Abshirini et al., 2016).

For intervention purposes, the children were observed for a 1-month period to develop a greater understanding of their abilities (Abshirini et al., 2016). The categories observed included: educational information and history, ability/interest, inability/weaknesses, skills to organize, and social interaction. Based on this assessment, a structured program was individualized for each child to be carried out through the 60-session intervention that was to be given (Abshirini et al., 2016). It should be noted that there was a reward system implemented which included occasional rewards after the completion of a task or activity.

During the first month of intervention, extensive observation and assessments were conducted to obtain a better understanding of the skills and capabilities of the child (Abshirini et al., 2016). During the second session(s) of therapy (sessions 21 to 23), parents were instructed as to how to implement the goals of therapy in the home environment (Abshirini et al., 2016). Sessions 24 to 26 were dedicated to visual and organizational goals. These were attained by

organizing the classroom with the goal of reducing stimulants and preparing a visual framework with images and drawings. The final section(s) of intervention (sessions 25 to 60) were activity-focused (Abshirini et al., 2016). “First-then” activities were presented to the children. The sequence was often based on completing a “less preferred” activity results in the following of a more pleasant activity. An example of this approach is “tying shoelaces and then playing computer game” (Abshirini et al., 2016).

This quasi-experimental study concluded that the intervention methods showed significant improvement in the Autism Treatment Evaluation Checklist (ATEC) score (Abshirini et al., 2016). ATEC is scored as follows:

> The first subscale, Speech/Language/Communication, contains 14 items where the score ranges from 0–28 points. The Sociability subscale contains 20 items and participants can score from 0–40. The third subscale, Sensory/Cognitive awareness, has 18 items and scores range from 0–36. Finally, the Health/Physical/Behavior subscale contains 25 items. The scores from each subscale are combined in order to calculate a Total Score, which ranges 0–179 points. A lower score indicates a lower severity of ASD symptoms. (Mahapatra, 2018).

The scores for TEACCH intervention are as follows: Pretest-106.05, Posttest-78.4 (Abshirini et al., 2016). The scores for the control group are as follows: Pretest-110.05, Posttest-120.07 (Abshirini et al., 2016). Significant differences in ATEC scores were also noted among different age groups (Abshirini et al., 2016). A greater change was found in the younger age group (aged 3 to 5) in comparison to the older age group (aged 5 to 9) (Abshirini et al., 2016). This finding supports the importance of early diagnosis and intervention. Ultimately, the study

concluded that TEACCH is more effective than the SIT program and no intervention method. Also proven is that TEACCH is effective across the Iranian culture (Abshirini et al., 2016).

TEACCH real-world application. Orellana, Martínez-Sanchis, and Silvestre (2014) conducted a study that aimed to evaluate the effectiveness of the TEACCH approach by measuring compliance with a clinical dental assessment. Routine dental checks are often complicated by the sensory difficulties displayed in autism spectrum disorder. Because of this, "most are treated under general anesthesia or unnecessary sedation" (Orellana et al, 2014). The study focused on children (aged 4–9 years) and adults (aged 19–41) (Orellana et al, 2014). For the purpose of this literature review, only data from the children will be reviewed for this literature review.

Thirty-eight children that were already receiving clinical and/or educational support for autism and/or an intellectual disability were chosen to participate in the study (Orellana et al, 2014). The inclusion criteria was as follows: (a) having being diagnosed with autism, Asperger Syndrome or Pervasive Developmental Disorder-Not Otherwise Specified, (b) children aged 4–10 years old (c) understanding visual or simple verbal instructions, (d) failure to undergo the 10 components of the oral assessment during the pre-intervention session, meaning intervention was necessary, and (e) written informed parental consent (Orellana et al., 2014).

At the onset of the study, an oral assessment was conducted in addition to a questionnaire (Orellana et al., 2014). The questionnaire provided information in regards to: health, cognitive status, and behavior (Orellana et al., 2014). Following the pre-test, five training sessions were completed before the final oral assessment (Orellana et al., 2014). During the test phases, 10 consecutive steps, that had been deemed necessary to complete a clinical oral assessment, were measured (Orellana et al., 2014). The steps were as follows: 1) entering the room, 2) sitting down

in the dental chair, 3) lying back in the chair, 4) tolerating direct light on the face, 5) opening the mouth, 6) tolerating manipulation of the mouth with gloves, 7) examination with the mouth mirror, 8) examination with the probe, 9) examination with mirror and probe, and 10) dental occlusion (Orellana et al., 2014).

Behavioral training strategies used during the study were derived from the TEACCH Program. Successive approaches adopted into the training program included: Tell—Show—Feel—Do (TSFD), visual pedagogy, in vivo modeling, audio-visual modeling, behavioral trials, and auto-modeling (Orellana et al., 2014). Training was administered in five 20-minute sessions, twice a week for three consecutive weeks (Orellana et al., 2014).

Overall, positive results were found in children of all variants of intellectual capabilities (Orellana et al, 2014). A greater number of components were achieved post-test for: high functioning children ($z = -3.744$, $p < 0.001$) and in children with mild ($z = -2.677$, $p < 0.01$) and severe intellectual disability ($z = -2.701$, $p < 0.01$) (Orellana et al., 2014). Behavior was recoded pre- and post-test showing statistically significant differences as well in the children ($z = -4.970$, $p < 0.001$) (Orellana et al., 2014). Behavior was evaluated by means of the Frankl scale. In the pre-test, 73.7% of children displayed a reluctant behavior in comparison to the post-test in which 81.6% showed positive behavior (Orellana et al., 2014). The TEACCH-based training program as used by the research team was deemed to be effective in increasing compliance in children with ASD (Orellana et al, 2014).

Outcome. The empirical research that has been completed on the TEACCH program conveys that this intervention method is successful method in improving: language, behavior (D'Elia et al., 2014; Orellana et al, 2014) and ATEC scores (Abshirini et al., 2016).

Visual Schedules approach to Autism Spectrum Disorder. Use of visual schedules is a commonly used intervention support for children with autism that aims to remove the element of surprise from the child's day-today activities. Schedules may be used for varying reasons that may include: (a) eliminate problem behavior from transitions, (b) to perform a series of tasks independently, (c) follow a sequence of tasks in a work or school setting, or (d) take charge of leisure time (Mesibov et al., 2002). The planning of schedules is just as important as the intervention itself. To provide the most successful intervention, the professional must tailor the schedule to meet the needs of each child (Mesibov et al., 2002). The main goals from this implementation are improvement of self-initiation, autonomy, generalization, and a decrease in problem behavior (Mesibov et al., 2002) The following three studies encompass the visual schedules approach to benefit the academic performance of children with ASD.

Visual Schedule overview. Spriggs, van Dijk, and Mims (2015) compiled literature to summarize the use of visual activity schedules (VAS) and how they are used. The use of VAS is, "considered EBP for increasing on- task, on-schedule, and transition behaviors for school-age children with ASD" (Spriggs, p.31, 2013). Importance of VAS are highlighted through the importance of a structured environment someone with ASD. Particularly in the school setting, VAS, "can be beneficial for students that have difficulty with organization, working memory, or changes in routine" (Spriggs, 2013, p.21). Previous literature has shown an increase in the following skills: daily living skills, physical activities, on task behaviors, vocational skills, leisure skills, and academic skills (Spriggs, 2013, p.21). In addition to the increase in positive behaviors, a decrease in negative behaviors have also been recorded in previous studies.

While there are many variants of VAS available, a particular type is chosen based on the needs and abilities of the student or client. Spriggs et al. (2015) present the following example:

> Students with visual impairments and students who are at the pre-symbolic communication level may benefit more from a schedule where each activity corresponds with an object (e.g. a pre-k schedule where a block represents the block center, a fork lunch, and a blanket nap time). (p. 22)

In order to identify the current symbolic ability of the user, Browder et al. (2008) developed an assessment for teachers to administer. Administration of this assessment ensures that the student is using a system that is most beneficial to them.

In order to create a schedule that is individualized to the student, Spriggs et al. (2013) recommend that the following is considered: (a) use of age appropriate representations, (b) knowing where, when, and how they will be used, and (c) facilitated environment in which the VAS will be used (pp. 23-24). Both high-tech and low-tech options are available for use depending on resources available to the user.

After designing the VAS, decisions must be made as to how implementation will take place. Implementation is designed based on (a) the type of schedule chosen, (b) the environment, and (c) the practicality for teachers and students (Spriggs et al., 2013). Routines must be established for how to indicate a step has been completed. This may be done by the user doing things such as crossing out the task, moving the pictures into another column, or placing the pictures in a folder. Similar to all of the previous steps, abilities of the student are a major factor in deciding what will be most beneficial. To increase productivity of intervention, proper training must be administered to the school personnel that will be working with the user. Consistency is a key to success in the use of VAS (Spriggs et al., 2013). The success of VAS has been observed through the increase of on-task/on-schedule behaviors for students diagnosed with ASD.

Visual Schedules effectiveness. Pierce, Spriggs, Gast, and Luscre (2013) conducted an experimental study to evaluate the effectiveness of visual schedules in the independent classroom setting. The participants included four students who had been diagnosed with moderate ASD and were in a self-contained classroom (Spriggs et al., 2013). Ages of the participants included: 11.1 years, 9.10 years, 10.5 years, and 10.3 years (Spriggs et al., 2013).

Intervention consisted of sessions that occurred daily, five days a week, and lasted for 30 minutes (Spriggs et al., 2013). Areas of the classroom were labeled as "centres" that included: mathematics, fine motor, literacy, and reading (Spriggs et al., 2013). The four students were given a visual activity schedule (VAS) book with pictures that represented the centre activities (Spriggs et al., 2013). The activities were represented by geometric shapes with colors specific to each centre (Spriggs et al., 2013). Sequencing of the centres was ordered to represent the steps that were to completed in the given time (Spriggs et al., 2013). An example sentence strip might have included the following example sequence, with visuals: stop, clean up, stand up, STAR (image only – meaning computer), sit (Spriggs et al., 2013).

Given the experimental design(single case research design), participants served as their own control. Pre-tests and post-tests were administered to assess the use of the VAS (Spriggs et al., 2013). The pre-test "measured independent transitions between and within centre activities without VAS" (Pierce et al., 2013, p. 239). The post-test was administered after the second VAS condition. Transitioning behaviors were recorded during the data collection. Prompting was given in the least amount for each step. Responses were then recorded as: independent, gesture + verbal, picture + verbal, or physical + verbal based on what was required to get the student to properly transition (Spriggs et al., 2013).

Social validity data, as recorded by three people who worked with the students, was obtained for the purpose of this study. Five questions were asked to study the objectives and outcomes of VAS. The following opinions were observed followed by their respective mean Likert scale answer (one = strongly disagree, five = strongly agree):

- VAS are useful tools for teaching classroom independence to students with autism (mean = 5).
- Participants increased independent behavior with the use of VAS (mean = 4.7).
- VAS use generalized to novel tasks (mean = 4.7) and novel pictures (mean = 4.7).
- VAS were a socially acceptable method for teaching independence within the classroom and outside the classroom (mean = 5) (Pierce et al., 2013, p. 265).

Table 3 has been complied to represent the data as found by Pierce et al. (2013, p. 265). Increases in transition behaviors can be observed in both within-centre and between-centre activities.

Table 3

VAS Effectiveness in Classroom Setting

	Experimental Group	Control Group
Independent Within-Centre Transitions	32% (22–48%)	93% (83–100%)
Independent Between-Centre Transitions	14% (0–40%)	95% (80–100%)

To increase independence in the school setting, the VAS framework is recommended by the research team (Spriggs et al., 2013).

Visual Schedule application. Brodhead, Higbee, Pollard, Akers, and Gerencser (2014) conducted a study in which activity schedules were used to teach children with autism how to play hide-and-seek. The study included six participants aged 3-5 years old (Brodhead et al.,

2014). All participants had been diagnosed with autism and enrolled in a preschool program that provided behavior-analytic instruction (Brodhead et al., 2014). Given that this type of instruction included the use of activity schedules, the participants were already accustomed to the use of activity schedules.

The linked activity schedule contained the following: (a) "small three-ring binder that contained four laminated pages" and (b) "[t]wo pages [with] discriminative stimuli for hider behavior, and two pages [with] stimuli for seeker behavior" (Brodhead et al., 2014, p. 647). Each participant played the role of the hider and seeker twice each. A response chain was provided that prompted the participants to complete the tasks (Brodhead et al., 2014). A sequential list for the hider condition was as follows: 1) open schedule, 2) attend to hiding place, 3) put "oh, no!" script on wrist, 4) arrive at hiding place, 5) wait at hiding place, 6) say, "oh no!," 7) return to schedule, 8) place "oh, no!" script on schedule, 9) turn page, and 10) say "Thanks for playing!" (Brodhead et al., 2014).

At the baseline assessment, all participants displayed game play that was not deemed appropriate (Brodhead et al., 2014). The same findings were displayed in the *schedule probe* sessions (Brodhead et al., 2014). Schedule probe sessions occurred when, "Linked activity schedules were available, but no prompts were provided" (Brodhead et al., 2014, p. 648). The purpose of this session was to test the ability of the participant to follow the activity schedule on their own (Brodhead et al., 2014). In contrast, when prompting (graduated guidance and vocal prompting) was used, two participants met the 80% stability criteria in eight sessions, two participants in 10 sessions, and the final two participants in seven sessions (Brodhead et al., 2014). In a session labeled as the *no-schedule probe*, activity schedules weren't provided (as in

the baseline assessment) (Brodhead et al., 2014). For this session, results appeared very similar to that of the baseline phase (Brodhead et al., 2014).

While the results of the study demonstrated that linked activity schedules can positively influence a child's behavior in appropriate gameplay, there are additional takeaways to be noted. The results shown from the no-schedule probe session indicate that a child will not benefit from the training of activity schedules without the presence of the schedule (Brodhead et al., 2014). If the goal of intervention is for the activity schedule to be a temporary support, success might not be as promising (Brodhead et al., 2014). However, the research team notes that, "…for many individuals with autism and related disabilities, activity schedules could be considered a type of permanent support, such as a planner, that is not meant to be faded" (Brodhead et al., 2014, p. 649).

Outcome. The use of visual schedules as an intervention method has been deemed successful (Pierce et al., 2013; Spriggs et al., 2015; Brodhead et al., 2014), but not without err (Brodhead et al., 2014). The use of visual schedules must be met with some kind of permanent support to provide a lifelong benefit of the intervention; should the visual schedules ever be taken away (Brodhead et al., 2014).

Applied Behavioral Analysis approach to Autism Spectrum Disorder. Applied Behavior Analysis (ABA) is a heavily researched area of ASD intervention. ABA can help children in advancing communication skills, following directions, simple commands, social skills, daily living skills, and to change problem behaviors (Children's Hospital, 2014). The following three studies encompass the Applied Behavioral Analysis (ABA) approach to benefit the academic performance of children with ASD.

ABA from a parental and professional perspective. Dillenburger, Keenan, Doherty, Byrne, and Gallagher (2012) conducted a study to gain a greater understanding of parental and professional opinions on ABA intervention through their own experience. The participants included 95 parents/primary caregivers and 67 professionals. Of the 95 parents, data was gathered on 100 children (some parents had multiple children diagnosed with ASD) (Dillenburger et al., 2012). Professionals that participated in the study included: speech-language therapists, ABA tutors, social workers, clinical psychologists, occupational therapists, autism therapists, child ward managers, behavior support workers, educational psychologists, learning disability nurses, education director, teacher, health visitor, learning disability coordinator, pediatrician, behavior analyst, psychiatrist, and liaison (Dillenburger et al., 2012. p.115).

To gather information, two questionnaires were distributed via mail or email attachment (Dillenburger et al., 2012). The Family Autism Needs Questionnaire (FAN-Q) included 69 questions for parents that inquired about: "family background and demographics, diagnosis and forward planning, educational provision, staff/parent training, finance, home and respite support, parental views and experiences, impact on family life, and assessment of future needs" (Dillenburger et al., 2012, p.115). The Professional Autism Needs Questionnaire (PAN-Q) included 29 questions for professionals that asked about: "professional background, training and experience, educational provision and ASD services, perception of parental and family situations, and professional assessment of future needs" (Dillenburger et al., 2012, p.116).

Eighty-two percent of professionals reported that parents of children with ASD experienced *significant* distress when attempting to find the proper education for their child (Dilenburger et al., 2012, p.116). Based on the data for 93 children, 44% attended eclectic

special school, 29% attended mainstream school, and 27% attended ABA-based school (Dilenburger et al., 2012, p.117). In reference to appropriateness of education:

> Of parents whose children attended mainstream or eclectic special schools, 45% felt that their child's education was always appropriate; 48% of these parents felt that their child's education was only sometimes appropriate; 6% felt their child's education was never appropriate; and one parent was unsure of the appropriateness of their child's educational provision. Of the parents whose child attended ABA-based schools, 67% felt their child's education was always appropriate; while 30% felt their child's education was sometimes appropriate. None of these parents felt their child's educational provisions were not appropriate, and one parent was unsure of the appropriateness of her child's education provision (Dillenburger et al., 2012, p.118).

99% of parents and 57% of professionals felt that there should be more opportunities for ABA schooling in the future (Dillenburger et al., 2012). The desire for future growth highlights the parent's needs of children with ASD and professionals in the field.

ABA effectiveness. Eikeseth, Smith, Jahr, and Eldevik (2007) conducted a study that focused on the effects of ABA treatment for children with ASD that extended the results of a 2002 study. Participants in the study met the following requirements: (a) a diagnosis of childhood autism, (b) aged 4 to 7 years at the start of treatment, (c) a deviation IQ of 50 or above or a ratio IQ of 50 or above, and (d) no medical conditions that could interfere with treatment (Eikeseth et al., 2007). Participants were assigned to either: 1) the ABA treatment group, or 2) the eclectic treatment group in which treatment was provided in public elementary schools (Eikeseth et al., 2007). During intervention, the child worked one-on-one with their therapists while, in the classroom, they were in conventional classrooms with their peers (Eikeseth et al.,

2007). Participants from the 2002 study continued receiving either the ABA or eclectic treatment since the previous study (Eikeseth et al., 2007). The current follow-up assessment measured the functioning of participants at an average age of 8 years.

The administered behavioral treatment was built using the *UCLA Model of Early Intervention* while the eclectic treatments was meant to show the most common practices in autism intervention (alternative communication, sensory-motor, TEACCH, total communication, clinical experience, etc.) (Eikeseth et al., 2007). The current assessment asked therapists to report the number of hours the child received treatment weekly in addition to the number of hours the child was mainstreamed in his/her classroom (Eikeseth et al., 2007). Functioning levels were measured via the WPPSI-R (Wechsler, 1989), Wechsler Intelligence Scale for Children-Revised (Wechsler, 1974), or Bayley Scales of Infant Development-Revised (Bayley, 1993) and adaptive behavior was measured via the Vineland Adaptive Behavior Scales (Sparrow, Balla, & Cicchetti, 1984) (Eikeseth et al., 2007). In the follow-up assessment, the child's teacher completed the Achenbach Child Behavior Checklist—Teacher Report Form (TRF; Achenbach, 1991) to measure behavioral problems (Eikeseth et al., 2007).

Results showed that an increase in IQ and adaptive behavior were found to be greater in the behavioral group in comparison to the eclectic group (Eikeseth et al., 2007). The ABA group showed a 25 point gain in IQ compared to 7 points by the eclectic group (Eikeseth et al., 2007). The behavioral group also, "obtained lower scores on the Maladaptive Behavior subscale of the Vineland Adaptive Behavior Scales ($M = 6.33$, $SD = 4.1$) than the eclectic group ($M = 11.0$, $SD = 5.8$), $t(20) = -2.20$, $p < .05$" (Eikeseth et al., 2007). Comparison of Year 1 progress and the current follow-up displayed greater differences in scores between the two treatment groups (Eikeseth et al., 2007). 54% of children in the behavioral group "scored within one standard

deviation of the mean on IQ at follow-up" while only 17% of children in the eclectic group did the same (Eikeseth et al., 2007).

This follow-up study reported on the progress of the children from the Eikeseth et al. (2002) study. Now, at a mean age of 8.2 years, the participants of the behavioral treatment group displayed a larger increase in scores (IQ, adaptive functioning, communication, daily living skills, and socialization skills), and a decrease in negative behavior (Eikeseth et al., 2007). At a mean age of 8.2 years, the eclectic group displayed the following results: +7 points in IQ, –10 points in adaptive functioning, –7 points in communication, –6 points in daily living skills, and –12 points in socialization (Eikeseth et al., 2007).

An increase in the difference between groups suggests that ABA should be administered beyond the Year 1 time point to provide maximum benefits (Eikeseth et al., 2007). An interesting finding of this study is that, "age at intake predicted neither treatment outcome nor gains in treatment for children in the behavioral group, suggesting that this variable may not be as important for outcome as previously thought" (Eikeseth et al., 2007). The Eikeseth et al. (2007) study suggests that children aged 4 to 7 years who use ABA intervention have the opportunity to achieve greater improvement in comparison to receiving other practices typically received by children with ASD (Eikeseth et al., 2007).

ABA application. Justin Leaf et al. (2017) conducted a study that focused on the outcome of *behavioral-based social skills* for children with ASD. After emails were sent out to the families of potential participants, a 20-minute interview was conducted to determine if inclusion criteria was met. Inclusion criteria for the intervention included: (a) no previous history of intervention from the agency conducting the study, (b) a formal and independent diagnosis of ASD, (c) between 3 and 7 years old, (d) a full scale IQ score of 80 or above, (e) social deficits,

and (f) displayed average expressive and receptive language capabilities (Leaf et al., 2017). After the screening process, the study included 15 participants (Leaf et al., 2017).

The intervention took place in a private clinic in a room that resembled a kindergarten classroom (Leaf et al., 2017). The study included a pretest and posttest in addition to four assessment periods (T1, T2, T3, and T4) throughout intervention (Leaf et al., 2017). Group A received intervention between T1 and T2 (early treatment) and Group B received intervention between T2 and T3 (late treatment) (Leaf et al., 2017). During assessment periods, there were group probe and community probe sessions. Group probe consisted of, "semi- structured group sessions that were similar to the SSG sessions with regard to activity type and group composition and were run by the SSG teachers and a support teacher," while community probes, " were left to vary in setting, structure, activity, materials, location" (Leaf et al., 2017, p.246). Each group probe session lasts 2 hours and was administered two times per group per each assessment period (Leaf et al., 2017). Community probe observations occurred for 20 minutes in the environment in which the participant spent most of their day (Leaf et al., 2017).

Social skills groups (SSGs) are defined by the research team as, "an intervention strategy in which three or more students, sometimes including students diagnosed with autism spectrum disorder (ASD), come together and are simultaneously taught a variety of social behaviors" (Leaf et al., 2017, p. 243). ABA models were used to construct the intervention sessions (Leaf et al., 2017). Intervention was based on: 1) student deficits, 2) group deficits, 3) deficits as displayed on the assessments, and 4) parent concerns (Leaf et al., 2017).

Data as gathered from the Social Scale Inventory System was as follows: Group A T1 through T4 scores, respectively: 60, 91.5, 98.6, 106.2 and Group B T1 through T4 scores respectively: 58.8, 63.4, 100.4, 104.4 (Leaf et al. 2017). The scores as presented on the

remaining three assessments display the same growth; Group A displayed their main progression during the time of intervention (T1 to T2) while Group B displayed their main progression during their time of intervention (T2 to T3) (Leaf et al., 2017). These results show that significant improvement was only gained during times of ABA-based SSG intervention (Leaf et al., 2017).

Outcome. Combined, the three research studies tell a successful story of ABA therapy. It has been made known that there is an increased need for proper schooling for children with ASD and that parents and professionals recommend that there are more opportunities for ABA schooling (Dillenburger et al., 2012). In order to be successful, ABA must be administered continuously (Eikeseth et al., 2007). Contrary to what was previously thought to be true, Eikeseth et al. made the claim that, "age at intake predicted neither treatment outcome nor gains in treatment for children in the behavioral group, suggesting that this variable may not be as important for outcome as previously thought" (2007). Finally, progression through intervention was displayed only during the time of ABA intervention (Leaf et al., 2017).

Augmentative and Alternative Communication approach to Autism Spectrum Disorder. Augmentative and alternative communication addresses expressive language deficits for children with autism. AAC can either supplement or substitute their current needs (Nunes, 2008). AAC requires minimal motor requirements, limited cognitive demands, and allow for easily deciphered messages (Nunes, 2008). AAC ranges from low-teach devices to mid-tech devices to high-tech devices. AAC can be administered in the forms of sign language or communication systems that use visual-graphic symbols (Nunes, 2008). The following three studies encompass the Augmentative and Alternative Communication (AAC) approach to benefit the academic performance and communication of children with ASD.

Effects of AAC on social-communication. Kristy Logan, Teresa Iacono, and David Trembath (2017) conducted *a systematic review of research into aided AAC to increase social-communication functions in children with autism spectrum disorder*. The aims of the systematic review are as follows: "…examine the extent to which communicative functions other than object requests have been targeted in AAC interventions … and determine whether outcomes have been evaluated in terms of maintenance, generalization, and the social validity of goals, procedures and outcomes" (Logan et al., 2017, p.53). The research team searched a total of four databases (Education Resources Information Center (ERIC), Cumulative Index to Nursing and Allied Health (CINAHL), Web of Science, Linguistic and Language Behavior Abstracts (LLBA), and PsycInfo) to locate their articles that were to be included in the review (Logan et al., 2017). On the four databases, inclusion criteria was applied and the search was narrowed from 913 articles to 30 that were included in the review (Logan et al., 2017).

Twenty-four of the studies included in the review were single-case experimental designs (SCEDs) and six were group studies (Logan et al., 2017). The studies included the following types of AAC systems: (a) dedicated SGDs (n = 5; 21%), and (b) the iPad/iPod Touch configured as SGDs (n = 7; 29%), and (c) low-tech aids incorporating pictures (n = 11; 46%) and d) photos (n = 3; 13%) (Logan et al., 2017).

Communication functions measured in the study were: object requests, behavioral regulation (requests for action and function of protest), social interaction (social routines, greetings, calling, and acknowledgements), joint attention (comments and requests for information) (Logan et al., 2017). Improvement on communication function was noted in all studies to some extent (Logan et al., 2017). In six of the SCEDs, evidence showed at least partial improvement, and in 18 evidence was shown for improvement in all participants over time

(Logan et al., 2017). The focus of communication in the current review was focused around the areas of communication that are typically problematic for children diagnosed with ASD for clinical implication purposes. This systematic review concluded that, "AAC interventions can be used to teach a variety of communication functions to children with ASD" (Logan et al., 2017, p.59).

Application of AAC. Jamy H. Meeks (2017) conducted a single subject design study intended to explore the effects that communication applications have on improving communication. The participants of the study were two preschool students that attended a public preschool and had been previously diagnosed with ASD. The participants met the following criteria: "(a) qualified for special education services with an ASD, (b) were between the ages of 3 and 5 years, (c) demonstrated deficits in communication; and (d) were physically able to reach out and touch icons on an iPad" (Meeks, 2017, p. 171).

Intervention was provided in the form of a speech generated device (SGD), an iPad, with a communication application called *Go Talk Now* (Meeks, 2017). After training was completed, the participant received intervention in the special education classroom during snack time (Meeks, 2017). Data from these sessions were recorded until five consecutive points were at 80% or higher (Meeks, 2017). At this point, intervention as then completed in the general education classroom during center time (Meeks, 2017). The device was presented with the following: "four pages, one for snack and one for centers for each student. Each page contained four pictures of snack choices for snack time and four pictures of high frequency center activities for center time" (Meeks, 2017, p.174).

In regards to data collection, frequency of communication behaviors was the main focus (Meeks, 2017). Independent responses were when the student touched the iPad such that the

picture became highlighted or generated speech. Incorrect responses were when the student selected an item via the iPad then refused to complete the selection. (Meeks, 2017). Baseline I was determined by data collection when showing the student the iPad and then asking what they wanted for snack. Training was then completed by means of a hand-over-hand type learning environment. Once training was complete and intervention could begin, the following order was followed.: 1) Intervention I, 2) Baseline II, 3) Intervention II, 4) Generalization (Meeks, 2017).

Results shown for the first participant, Aiden, were obtained during a total of 36 sessions. Starting with a baseline mean of 0 (meaning that he did not attempt to use the communication application), Aiden completed the final intervention phase with a mean of 89 and an increase in behavior by 47% (Meeks, 2017). Results shown for the other participant, Kasie, were obtained over the course of 40 sessions. Kasie began, at baseline, with a mean of 0 and progressed to a mean of 90.2 in behaviors by the final intervention phase (Meeks, 2017). In addition to use of the communication application , Kasie began verbalizing requests during the Intervention I session (Meeks, 2017). Due to the fact that both participants displayed an increase in communication due to the use of the iPad, the study proved that, "a positive correlation between SGD and increased communication among students with ASD is probable" (Meeks, 2017, p.180).

Dynamic Assessment of the effectiveness of AAC. Cathy Binger, Jennifer Kent-Walsh, and Marika King (2017) conducted a study that assessed the developmental readiness of 3- and 4-year-olds to produce early sentences via an iPad communication application. Dynamic assessment (DA) procedures were used to assess the abilities of the participants. During DA, "With DA, the examiner uses various cues to facilitate the child's performance, with a primary goal of establishing whether or not the targeted skill is within the child's zone of proximal development (Vygotsky, 1978)" (Binger et al., 2017, p.1946). DA, as used by the research team,

strives to provide ongoing support for the participants. The study included 10 participants in which all previously participated in a language sampling study (Binger, Ragsdale, & Bustos, 2016). Participants met the following criteria:

> (a) be between the ages of 3;0 and 4;11 at the onset of the study, (b) have receptive language within normal limits, (c) have a severe speech impairment as defined by less than 50% intelligible speech and (d) have an expressive vocabulary of at least 25 words via any communication mode (Binger et al., 2017, p.1948).

Participants were provided with an iPad that had the application *Proloquo2Go* downloaded. In the application were vocabulary and synthesized speech (voice output) (Binger et al., 2017). Sessions took place within 60-minute increments (Binger et al., 2017). Trials given to the participant included: (a) agent-action-object, (b) entity-attribute, and (c) possessor-entity (Binger et al., 2017). Probes were used throughout intervention to mediate data collection (Binger et al., 2017) The following is an example of an administered probe: "a clip depicting Mickey Mouse chasing Minnie Mouse was shown, and the examiner then provided an elicitation prompt ("What's happening?") and provided the child with time to produce "Mickey chase Minnie"" (Binger et al., 2017, p.1951). Results of the study showed that, during DA, 89% of responses were produced correctly at least once with cueing (Binger et al., 2017). During the intervention stage, mastery was demonstrated at 86% (Binger et al., 2017). The current study evaluated not only the effects of AAC but also the additional effects casued by added dynamic assessment. The study provides support to DA task-structure to assist in the formation of expressive syntax for children who use AAC (Binger et al., 2017).

Outcome. The studies regarding AAC as communication intervention support the use of AAC. The studies found that, "AAC interventions can be used to teach a variety of

communication functions to children with ASD" (Logan et al., 2017, p.59). A study resulted in the finding that, due to the use of an iPad, there was an increase in communication (Meeks, 2017). In addition, the study proved that, "a positive correlation between SGD and increased communication among students with ASD is probable" (Meeks, 2017, p.180). The final empirical source displayed how DA performs in relation to AAC, proving that: DA task-structure is effective in assisting the formation of expressive syntax for children who use AAC (Binger et al., 2017).

Verbal Behavior Therapy Approach to Autism Spectrum Disorder. The Verbal Behavior (VB) approach to communication and language uses aspects of ABA. The verbal behavior approach to autism falls under the categories of ABA and Early Intensive Behavior Therapy (EIBI). The VB approach, "views language functionally with each verbal response defined by its unique antecedent and consequences" (LeBlanc et al., 2006). To teach language, this approach focuses on the *why*. VB hopes to allow children to understand, "why we use words and how they are useful in making requests and communicating ideas" ("Verbal Behavior Therapy"). The following three studies encompass the Verbal Behavior Therapy (VBT) approach to benefit the academic performance of children with ASD.

Music Therapy as VBT. Lim and Draper (2011) conducted a study that incorporated music therapy with ABA and VBT as an approach for children with ASD. The goal of the intervention was to enhance the speech production of children with ASD. Participants included 22 preschoolers (aged 3- to 5-years-old) who had been previously diagnosed with ASD and were, "verbal or preverbal with presence of immediate echolalia" (Lim et al., 2011, p.536). Target productions were established as the following four categories: mand, tact, echoic, and intraverbal. The music therapy aimed to train the child with ASD speech and language

development and consisted of singing the instructions (Lim et al., 2011). Songs and texts, as provided in intervention, contained 30 target words (Lim et al., 2011). Pre- and post-tests were administered to gather the child's production of target words (Lim et al., 2011). *Correct* responses contained the following four components: semantics, phonology, pragmatics, and prosody (Lim et al., 2011).

T-tests were conducted in order to determine intervention effect. Music training produced the following scores: M = 34.45, SD = 14.77 (Lim et al., 2011). The scores for music training were higher than speech training: M = 32.91, SD = 15.53 (Lim et al., 2011). Both of the preceding scores were higher than that of the no training condition which produced: M = 25.22, SD = 14.51 (Lim et al., 2011). The results found in the *t*-tests articulate that both music and speech training had a positive effect on verbal production of target words in comparison to the no training condition. There was not a significant difference found between music and speech training. When testing covariance, it was found that, "music training was most effective in echoic production… and speech training was most effective in tact production" (Lim et al., 2011, p.542). The findings of the current study support the use of both music and speech training interventions for children with ASD (Lim et al., 2011). The findings supporting music are rooted in the Applied Behavioral Analysis Verbal Behavior Therapy Approach.

Comparison of VBT and Pivotal Response Treatment. For the purpose of the current literature review, focus will remain on the findings related to VBT. Stock, Mirenda, and Smith (2013) conducted a quasi-experimental study that centered around a *Comparison of community-based verbal behavior and pivotal response treatment programs for young children with autism spectrum disorder.* Participants that were in the VBT condition were enrolled in a group applied behavior analysis (GABA) preschool and met the following requirements: "(a) an ASD

diagnosis, (b) a chronological age of less than 6 years, and (c) the absence of serious problem behaviors that required 1:1 dedicated support" (Stock et al., 2013, p.1170). The participant pool included 14 children aged 37-59 months (Stock et al., 2013). Fourteen participants were also in the Pivotal Response Treatment (PRT) group (Stock et al., 2013). Eligible for participation in the study were children enrolled in an autism intervention program (NS EIBI) in Canada and had a previous diagnosis of ASD and were aged 2-6 years (Stock et al., 2013).

Data measures were taken at baseline and 12 months later for both sets of participants (Stock et al., 2013). The following tests were administered to measure language and communication, cognitive ability, adaptive behavior, problem behavior, and parenting stress: *Preschool Language Scale, Merrill-Palmer-Revised Scales, Vineland Adaptive Behavior Scales, Child Behavior Checklist, and Parenting Stress Index Short Form* (Stock et al., 2013). Intervention for the VBT condition was based on target skills that, "were identified for each child in domains that included visual performance skills, receptive language, imitation, manding, tacting, and intraverbals…. also included skills for independence such as toilet training, self-dressing, and feeding, as well as group skills" (Stock et al., 2013, p.1172). Intervention took place using Intensive Teaching (IT) and Natural Environment Teaching (NET) (Stock et al., 2013). For the PRT condition, intervention was based on, "… goals with an emphasis on functional communication and developmentally appropriate social and play skills" (Stock et al., 2013). Table 4 displays results found in the current study (Stock et al., 2013):

Table 4

Verbal Behavior and Pivotal Response Treatment Programs

	GABA Group	NS EIBI Group
Cognitive Scores	*Gained 8.42 points* Increase – 11 participants Decrease – 3 participants	*Gained 13.15 points* Increase – 10 participants Decrease – 4 participants
Receptive Language	*Gained 10.36 months* Increase – 14 participants Decrease – 0 participants	*Gained 9.22 months* Increase – 13 participants Decrease – 1 participants
Expressive Language	*Gained 7.07 months* Increase – 12 participants No change – 2 participants	*Gained 10.35 months* Increase – 14 participants Decrease – 0 participants
Adaptive Behavior	*Gained 2.72 points* Increase – 8 participants Decrease – 4 participants No Change – 2 participants	*Gained 5.5 points* Increase – 10 participants Decrease – 4 participants
Problem Behavior	*Decreased 4.79 points* Decrease – 12 participants Increase – 2 participants	*Decreased 2.62 points* Decrease – 10 participants Increase – 3 participants
Parenting Stress	*Decreased 1.8 points* Decrease – 6 participants Increase – 4 participants	*Decreased 3.1 points* Decrease – 5 participants Increase – 5 participants No Change – 1 participant

Note: Italicized is the average change for each category. Below, the individual changes are noted.

The study presents much similarity in the outcomes of both intervention programs. For the purpose of the literature review, the outcomes for the GABA group should be capitalized. There were positive changes established in all categories; however, changes as presented in the adaptive behavior and parenting stress categories were not significant. As presented in the study, Verbal Behavior Therapy, in addition to Pivotal Response Therapy, is a recommended intervention approach to ASD.

VBT approach. Chu (2016) conducted a study that considered *family-centered applied behavior analysis verbal behavior intervention for young Taiwanese children with disabilities.* The participants included one child with autism (C1) and two children with developmental delays (C2 and C3). For the purpose of this literature review, focus will be on the child that has ASD. Aside from a diagnosis of ASD, the child additionally met the following criteria: (a) "the child's family and/or teacher indicated at least one area of language that the child was unable to perform in certain contexts," and (b) "agreement by the child's family to participate" (Chu, 2016, p.83).

Intervention took place in the Child Development Center at a university in Taiwan and consisted of the child being seated with two interns; one intern performed the intervention and one intern collected data (Chu, 2016). Family-centered practice guidelines were followed throughout intervention as a centering principle (Chu, 2016). The parent-professional collaboration model contained three stages: 1) conducting assessment, 2) service planning, 3) outcome evaluation (Chu, 2016). Incorporating VBT into the intervention, target words and phrases for the four verbal operants were used (Chu, 2016). Upon presentation of verbal stimuli, the following additional strategies were incorporated:

(a) identifying functional vocabulary words…, (b) selecting functional vocabulary words as the targeted words or phrases, (c) using repetition and review, (d) incorporating errorless learning to ensure the child's success, (e) expanding the child's communication and language, (f) providing a variety of materials, (g) providing many learning trials, and (i) facilitating interaction using the child's motivation (Chu, 2016, p.84).

The Assessment of Basic Language and Learning Skills-Revised (ABLLS-R) was used to collect data in relation to operant production (Chu, 2016). Participant C1 showed increase in all four verbal operant domains (Chu, 2016). The Receptive and Expressive Vocabulary Test (REVT) was used to collect data. Results from pre- and post-test conditions of ABLLS-R are listed, respectively: visual performance – 36%, 61%, receptive – 30%, 50%, imitation – 36%, 73%, request – 14%, 28%, labelling – 5%, 30% (Chu, 2016). Overall, participant C1 displayed increase in all operants. Interpreting this study to only include one participant limited the amount of gathered data. The data from this study is still useful to the current literature review due to the fact that it conveys intervention effects.

Outcome. In summary, VBT was recommended by all studies. It was found that, "music training was most effective in echoic production… and speech training was most effective in tact production" (Lim et al., 2011, p.542). Verbal behavior therapy was found to provide improvement in the following categories: (a) cognitive scoring, (b) receptive language, (c) expressive language, and (d) problem behavior (Stock et al., 2013). VBT was found to have no significant effect on adaptive behavior and parenting stress (Stock et al., 2013). VBT has the strength to increase all operant domains (Chu, 2016).

Social Skills Approach to Autism Spectrum Disorder. Deficits in social skills is a commonly displayed trait across children with ASD. Social skills intervention is designed to

approach and improve this deficit through instruction. The following three studies encompass the Social Skills approach to benefit the academic performance of children with ASD.

Peer-Mediated social skills intervention. Maich, Hall, van Rhijn, and Squires (2018) conducted a study that evaluated *A Peer-Mediated Social Skills Intervention for Young Children with Autism Spectrum Disorder and Other Social Challenges***.** The study contained a peer-mediated social skills program, Stay, Play, and Talk, (Maich et al., 2018). Phase 1 of the study contained three children aged between 4 and 6 years old and had a previous diagnosis of ASD (Maich et al., 2018). Two of the participants (Bradley and Lance) were enrolled in a full-day kindergarten program (Maich et al., 2018). The third participant (Tanner) was in an IBI program in which intervention took place primarily in the child's home and a child care center (Maich et al., 2018). During baseline testing, educators completed a questionnaire in order for the research team to gather information regarding the child's current social skills abilities (Maich et al., 2018). The same questionnaire was administered following intervention for assessment (Maich et al., 2018). Intervention occurred using the following schedule: "Data collection occurred twice weekly, in three 10-minute intervals across two hours per day, and during pre-arranged situations in which opportunities for social interaction skills existed; more specifically, during either structured activities, informal interactions with peers, or child-directed play" (Maich et al., 2018, p. 90).

Results from Phase 1 of the study showed that Bradley and Lance experienced an increase in social interaction during structured activities when compared to unstructured activities (Maich et al., 2018). The increase was not maintained throughout the week (Maich et al., 2018). Due to the structure of Tanner's child care center, ample opportunity was not given for structured activity so, therefore, he did not display a change in social interaction (Maich et

al., 2018). Phase 2 of the current study will not be included in this literature review because it contains children that have not received a diagnosis of ASD. The current study shows the impact that setting can have on intervention methods. While the same intervention method was implemented, different results were found due to the difference in setting. To set up a successful intervention method, the research team found that, "the structure, intensity, and teaching methodology utilized may be important to consider when using this approach for individuals with social communication difficulties" (Maich et al., 2018, p. 100).

Social Skills application in public school. Licciardello, Harchik, and James Luiselli (2008) conducted a study that focused on *Social Skills Intervention for Children with Autism During Interactive Play at a Public School.* Participants included three boys (Andrew, Wes, and Mike) and one girl (Carrie) who met had a previous diagnosis of ASD (Licciardello et al., 2008). The ages of the participants are as follows: 6 years old, 7 years old, and two 8 year olds (Licciardello et al., 2008). Data was gathered from daily recess time when the children were interacting with each other and an additional 150 typically-developing students (Licciardello et al., 2008). Social initiation and social response were the measures taken during this time (Licciardello et al., 2008). These measures are defined, by the research team, as follows:

> A social initiation was defined as a participant requesting attention by verbalizing to, looking at, or touching appropriately the body of a peer… social response was defined as any verbal or physical behavior by a participant that immediately followed an initiation from a peer and was acceptable (Licciardello et al., 2008, p.29).

The intervention also used prompting, preteaching, praise, and rewards to increase social initiation and social response (Licciardello et al., 2008).

All participants social initiations and social responses increased from baseline. For Carrie, social initiations increased from 1.4% to 19.6% and social responses increased from 11.0% to 39.8%. Andrew's social initiations increased from 4.4% to 43.9% and social responses increased from 6.2% to 26.7%. Wes's social initiations increased from 4.8% to 20.7% and social responses increased from 31.8% to 45.1%. Mike's social initiations increased from 3.7% to 29.6% and social responses increased from 16.5% to 37.0% (Licciardello et al., 2008). The study found that, in regards to social skills intervention, "intervention combining preteaching, prompting, praise, and rewards increased social initiations and social responses of four children with autism" (Licciardello et al., 2008, p. 33).

Social Skills training program. Chung, Reavis, Mosconi, Drewry, Matthews, and Tasse´(2007) conducted a study that applied. "a peer-mediated social skills training (SST) program combined with video feedback, positive reinforcement and token system," to test the effectiveness of peer-mediated SST (p. 423). Participants in the study included four children that had a previous diagnosis of ASD (Chung et al., 2007). The following criteria was additionally met by participants:

> (a) were between the ages of 6 and 7 years, (b) met criteria for the DSM-IV diagnosis of ASD, (c) did not meet criteria for mental retardation, (d) were able to engage in at least two turns of back and forth verbal communication with basic listening skills (Chung et al., 2007, p. 425).

The intervention was administered over the course of 12 weeks and included: baseline testing, social skills training, and a wrap-up session (Chung et al., 2007). Baseline testing consisted of videotape recordings in which the research team coded to analyze social behavior patterns (Chung et al., 2007). SST was administered for 11 weeks and each session was

structures as follows: “explanation of skill of the day, teaching/didactic time, practice time, snack time, video time, and wrap-up” (Chung et al., 2007, p. 427).

Results gathered from the data found that: (a) Michael increased his appropriate talking and decreased inappropriate talk, (b) Steven increased his use of appropriate phrases and showed no change in his rate of inappropriate talking, (c) Joshua increased use of appropriate talking and decreased inappropriate talk, (d) Richard slightly increased appropriate talk and slightly decreased inappropriate talk (Chung et al., 2007). This study concluded that, in combination with video feedback and behavior management, social skills training is an effective intervention to increase communication skills in children with high-functioning autism (Chung et al., 2007). The research team notes the importance of criteria to be met prior to the start of training (Chung, 2007). The *prerequisite skills* that should be used in this intervention are as follows: “ability to attend and listen to others, turn-taking, and appropriate voice volume” (Chung et al., 2007, p.434).

Overview. In summary, social skills training is recommended to improve the social abilities of children with autism. Attention to proper setting is a key in ensuring a successful intervention approach (Maich et al., 2018). Social skills, “intervention combining preteaching, prompting, praise, and rewards increased social initiations and social responses….” (Licciardello et al., 2008, p. 33). Combining the proper video feedback and behavior management techniques was found to result in successful outcomes for Chung et al. (2007). To successfully perform intervention, certain prerequisite skills must be met by the child with ASD (Chung et al., 2007).

Results

The results chapter presents the data gathered in the current literature review. The data will be presented in the form of a table. Table presentation was chosen in order to condense the information and display in a straightforward way. The table below has been compiled to represent the findings of the current literature review. The table is separated into the following categories: (a) intervention, (b) study, (c) setting, (d) participant age and size, (e) professional performing intervention, (f) effects on communication, and (g) outcomes. The 19 studies included in the literature review are located in the table and described using the listed categories. The abbreviation "n/a" is listed in the table when the information was not provided in the study or when the information was not applicable to the study. The intervention method listed is one of the six interventions used in the literature search. Following the intervention method is the specific study, listed by authors names. Participant age and size includes the age range of participants in the study and how many participants were included. Interventionist is listed to make known who was the individual(s) performing the intervention in the study. Effects on communication includes results that demonstrated effects had on communication abilities. The outcomes portion of this table displays the main findings of each study.

Table 5
Summary of Literature

Intervention	Study	Setting	Participant Age and N	Interventionist	Effects on Communication	Outcomes
TEACCH	Mesibov & Shea, 2009	Variable: Structured Environment	Variable: contained multiple studies	Interventionist trained in TEACCH	n/a	TEACCH has proven to be an example of EBP in the realm of autism interventions.
	D'Elia et al., 2014	Home and School	2.0-6.11 years; 30	Educators - school setting; Parents -/guardians at home	Increase in CDI language comprehension and production, ADOS communication, ADOS social interaction, ADOS total language skills, and VABS communication	The control group had lower mean scores which were observed for autism severity – shown through the lower mean scores in the EG. Improvement in language skills was noted across both groups, however, notably more significant in the EG. Scores gathered by the VABS proved to be higher in the EG as well.
	Abshirini et al., 2016	Autism Center	3.0-9.0 years; 60	Therapist	Decrease in ATEC score post-intervention; more of a change noted for younger ages	The scores for TEACCH intervention are as follows: Pretest-106.05, Posttest-78.4. The scores for the control group are as follows: Pretest-110.05, Posttest-120.07. Significant differences in ATEC scores were also noted among different age groups.
	Orellana et al., 2014	Dentist Office	4.0-9.0 years; 38	Instructors not specified	Increased social compliance	A greater number of components were achieved post-test for: high functioning children and in children with mild and severe intellectual disability. Recorded behavior showed statistically significant differences here as well in the children.
Visual Schedules (Visual Activity Schedules)	Spriggs et al., 2013	School	School-age; n/a	All adults involved with the student while the schedule was in use	The increase of on-task/on-schedule behaviors for students diagnosed with ASD	The success of VAS has been demonstrated through the increase of on-task/on-schedule behaviors for students diagnosed with ASD.
	Pierce et al., 2013	Self-Contained Classroom	9.10-11.1 years	Teacher	Increases independence in the school setting	Increases in transition behaviors can be observed in both within-centre and between-centre activities by using VAS.
	Brodhead et al., 2014	n/a	3.0-5.0 years; 6	Instructors	n/a	"…for many individuals with autism and related disabilities, activity schedules could be considered a type of permanent support, such as a planner, that is not meant to be faded" (p. 649).

Applied Behavioral Analysis	Dillenburger et al., 2012	1) Schools 2) non-intensive ABA-based home programs	Mean age of 8; 100 (reported on via family and professionals)	SLPs, ABA tutors, social workers, clinical psychologists, OTs, autism therapists, child ward managers, behavior support workers, educational psychologists, learning disability nurses, education director, teacher, health visitor, learning disability coordinator, pediatrician, behavior analyst, psychiatrist, liaison offer	n/a – Communication outcomes combined with other variables	It has been made known that there is an increased need for proper schooling for children with ASD and that parents and professionals recommend that there are more opportunities for ABA schooling.
	Eikeseth et al., 2007	School/Classroom	4.0-7.0 years; 25	A special education teacher and one or more aides	Increase in Vineland Adaptive Behavior Scales in the following categories: (a) communication and (b) socialization. A greater increase than displayed in the eclectic group.	Children aged 4 to 7 years who use ABA intervention have the opportunity to achieve greater improvement in comparison to receiving other practices typically received by children with ASD.
	Leaf et al., 2017	Private Clinic	3.0-7.0 years; 15	Teachers and a support teacher	Improved social behavior.	Significant improvement in social skills was only presented during the time of ABA-based SSG intervention.
Augmentative and Alternative Communication	Logan et al., 2017	Naturalistic contexts	Early Intervention Age; 30 studies	AAC Interventionists	Improving communication in the forms of: (a) object requests, (b) requests for action, (c) information, and social routines, as well as (d) commenting and (e) greeting.	"AAC interventions can be used to teach a variety of communication functions to children with ASD."
	Meeks, 2017	Public Preschool	3.0-5.0 years; 2	Special education teacher, researcher, training assistant	"Results of the study proved a positive implication on the use of SGD to improve communication among students with ASD and limited spoken language skills."	"Based on the findings of this study, in combination with existing research, a positive correlation between SGD and increased communication among students with ASD is probable."
	Binger et al., 2017	University setting in a private research room	3.0-4.11 years; 10	The first and third authors and one speech-language pathology graduate student	DA task-structure is effective in assisting the formation of expressive syntax for children who use AAC.	"In summary, findings from this investigation contribute to an emerging body of literature showing promise for use of DA and implementation of interventions focused on rule-based linguistic structures with young children using aided AAC."
Verbal Behavior Therapy	Lim & Draper, 2011	Preschool	3.0-5.0 years; 22	Board certified music therapist and speech-language pathologist	"music training was most effective in echoic production… and speech training was most effective in tact production" (p. 542)	The findings of the current study support the use of both music and speech training interventions for children with ASD. The findings supporting music are rooted in the Applied Behavioral Analysis Verbal Behavior Therapy Approach.

	Stock et al., 2013	Home and daycare/preschool settings	Less than 6.0 years; 14	Doctoral-level psychologist and two masters-level clinicians for the GABA program and therapists and parents for the NS EIBI program	GABA improved: receptive language by 10.36 months and expressive language by 7.07 months. NS EIBI improved receptive language by 9.22 months and expressive language by 10.35 months.	There were positive changes established in all categories; however, changes as presented in the adaptive behavior and parenting stress categories were not significant. As presented in the study, Verbal Behavior Therapy, in addition to Pivotal Response Therapy, is a recommended intervention approach to ASD.
	Chu, 2016	Child Development Centre	3.0-5.0 years; 3	Two trained college students	Increased all ABA operant domains.	Results from pre- and post-test conditions of ABLLS-R are listed, respectively: visual performance – 36%, 61%, receptive – 30%, 50%, imitation – 36%, 73%, request – 14%, 28%, labelling – 5%, 30% .
Social Skills	Maich et al., 2018	Child care centres and full- day Year-1 to -2 kindergarten classrooms	4.0-6.0 years; 3	Five student data collectors, educators	Bradley and Lance experienced an increase in social interaction during structured activities when compared to unstructured activities. The increase was not maintained throughout the week. Due to the structure of Tanner's child care center, ample opportunity was not given for structured activity so, therefore, he did not display a change in social interaction.	"The structure, intensity, and teaching methodology utilized may be important to consider when using this approach for individuals with social communication difficulties" (p. 100).
	Licciardello et al., 2008	Public elementary school	6.0-8.0 years; 4	Paraprofessional staff	Social initiations and social responses increased from baseline.	The study found that, in regards to social skills intervention, "intervention combining preteaching, prompting, praise, and rewards increased social initiations and social responses of four children with autism" (p. 33).
	Chung et al., 2007	n/a	6.0-7.0 years; 4	The first three authors/clinicians took turns leading and two undergraduate students videotaped and coded.	a) Michael increased his appropriate talking and decreased inappropriate talk, b) Steven increased his use of appropriate phrases and showed no change in his rate of inappropriate talking, c) Joshua increased use of appropriate talking and decreased inappropriate talk, d) Richard slightly increased appropriate talk and slightly decreased inappropriate talk.	This study concluded that, in combination with video feedback and behavior management, social skills training is an effective intervention to increase communication skills in children with high-functioning autism.

Conclusion

The results section of this literature review aimed to present the findings of the current study in a comprehensible table. Table 5 was constructed to showcase the major findings of the current literature review. The major findings will be combined to form the conclusions of this literature review. The table will be elaborated and reflected on in the discussion section to follow.

Discussion

A review of current literature investigates the role that interventions for ASD play in development and management of communication abilities. Nineteen studies were reviewed for this literature review. This review aimed to discover the intervention methods that address the most common communication difficulties in children with ASD. Six EBP intervention methods were explored and reported on in the previous two sections. This discussion section includes elaboration of the findings of the current literature review. The sections included are as follows: (a) introduction, (b) implications, (c) limitations, (d) future research, and (e) conclusion. Combined, these categories will represent the entirety of the findings of this literature review. The ASD interventions chosen to be included in this literature review have all, in previous literature, been defined as evidence-based practice with the exception of Verbal Behavior Therapy. Up until this point in time, VBT lacks the proper evidence required to be considered an EBP. Considering that the majority of interventions included in this literature review have been previously proven to be effective, the aim was not to test effectiveness; rather, the aim was to test the effect these interventions had on specific communication skills.

Findings

The findings of this literature review were displayed in Table 5 in the results section. From the table, the findings can be gathered. Overall, the findings of the current literature review suggest that all interventions included in this literature review have an effect on communication abilities in children with ASD with the exception of three studies in which communication was not applicable.

Implications

The findings of the current literature review are intended to be applicable in the public school setting. While not all of the studies included in this literature review were conducted in the school, all programs were said to have been used in the school setting. Because of this, implications will be applied, broadly, within this setting. Within the public school setting, implications for the classroom and SLPs will be explored. In addition, implications for parents will be included in this section due to the significant role that they play in the development of their child with ASD. Additionally, there were numerous studies included in the current literature review that included parents as participants or as informants.

Implications for parents. When considering intervention methods for students with ASD, parents and family members play an important role. Throughout the intervention process, parental involvement remains crucial. In order to implement an intervention method successfully, the intervention must be carried out outside of the classroom. Consistency and continuation of intervention in the home environment help to ensure that the student is receiving the most exposure to ensure a successful journey. D'Elia et al. (2014), requested that intervention be continued into the home, by the parents and caregivers. While educators were the primary interventionist in the school setting, parents/guardians assumed this role when the children returned home. The success of this study can be contributed to the carry-over of intervention into the home. Maintaining a structured environment is observed through the application of visual supports (Spriggs et al., 2013). In order to determine the positive effects that visual schedules can have on a student with ASD, the schedule must be put to use in all environments so the student can become entirely comfortable with usage. Consistency was found to be a key to success in the use of VAS (Spriggs et al., 2013).

Parental stress is a factor that is heavily researched within the area of students with ASD. To examine what causes parental stress, allows for a push for change (Dillenburger et al., 2012). According to Dillenburger at al. (2012), 82% of professionals reported that parents of children with ASD experienced *significant* distress when attempting to find the proper education for their child. The same study highlighted the desire for future growth of programs: 99% of parents felt that there should be more opportunities for ABA schooling in the future (Dillenburger et al., 2012). Accounting for parenting stress as a factor, should provide evidence for the need for growth of opportunity for children with ASD. This implication is intended to be applied by others via the information of parents.

Implications for the classroom. Implications in the classroom setting are unique in that they can be applied by a number of professionals. Professionals located in the classroom may be: teachers, teacher assistants, student teachers. Whether the student with ASD has been placed in a self-contained classroom, a typically developing classroom, or a combination, the educators in these settings are the people that spend the most time with these children each day. Given this significant contact, educators are most reliable in questioning the abilities and progress of children (Maich et al., 2018). Consistency of intervention, as lead by the interventionist, should be carried over into the classroom for maximum effects (Brodhead et al., 2014).

Implications for Speech-Language Pathologists. The role of therapists, not only SLPs, functioned as a major catalyst in the studies included in this literature review. Creating, implementing, and finishing out intervention are the roles assumed by therapists. A role assumed by the SLP is the building and support of communication goals. Communication being one of the primary difficulties faced by students with ASD, SLPs play a large role in the area of intervention. As found through the application of AAC devices, a variety of communication

functions can be taught to children with ASD (Logan et al., 2017). Communicative advancement was shown through 16 out of 19 studies included in the current literature review. Linking all success of communicative advancement to SLPs would not be accurate due to the fact that SLPs were not present in all studies. SLPs, in addition to parents and educators, are responsible for consistency in intervention application.

Limitations

There were a number of limitations in the current literature review that should be considered when interpreting the findings. First is the limitation of limited available data. For the intervention method of TEACCH, there were four studies that met the inclusion criteria and, therefore, were included in the literature review. The other intervention methods however, were limited to three studies because of exclusion criteria ruling out any other possible studies. Another limitation to the current study was excluding studies dated before 2004. While these studies were deemed to have been too dated to provide reputable information, there could have been important findings excluded because of the year. Another limitation to the current study was applicable settings in the studies. The aim of the literature review was to focus on school-based intervention; however, only ten out of nineteen studies took place in the school setting. Since the main purpose of the study was to draw conclusions from intervention methods, these studies were included regardless of setting. Another limitation resulted from the varying levels of subjects with ASD. Across the 19 studies, the rate of high-functioning to low-functioning ASD was variable. This limitation made comparing results partially unequitable. The fact that inclusion criteria was adjusted to include comorbidity affected the results as well. It was found that to exclude comorbidities excluded a majority of the studies that were to be included in this literature review. In order to have enough studies to consider, comorbidities had to be included.

In attempt to combat this limitation, data was limited to ASD collection as much as possible. Another limitation to consider when interpreting this data is the number of interventions each subject received prior to the treatment (study) or concurrently. This was an element that was not often reported on in the studies; however, this is a large factor in success of the treatment. The final limitation to consider in the current literature review is the number of studies excluded from the inclusion criteria. There was a total of six out of nineteen studies included in this literature review that did not meet the inclusion criteria. While these studies provided insightful information into intervention methods, they did not meet all criteria originally intended to gain inclusion. These limitations should be considered when interpreting the findings of the current literature review.

Future Research

There is much room for growth in communication intervention for students with ASD. The field of ASD intervention could benefit from an increase in research in the public school setting. Because this is a place where a majority of intervention for school-aged children takes place, additional research should be conducted in this setting to assure efficacy of practice. Found by Maich et al., 2018, results from identical intervention methods can differ based solely on setting. This is why additional research should be conducted in the public school setting. Additionally, future studies that research the topic of communication progress in intervention is crucial. There were a very limited number of studies that reported directly on the effect intervention had specifically on communication. Considering communication deficit is one the major landmarks of ASD, the result of intervention on communication is essential to the development of those individuals with ASD.

Conclusion

The current literature review aimed to examine ASD intervention in the public school setting by analyzing the effectiveness of six EBPs. Intervention in public schools can attribute success to two contributing factors: consistency and opportunity. The lack of availability of appropriate intervention methods provides a hindrance on the success of students with ASD. In contrast, having the availability of opportunity to students with ASD for appropriate intervention provides an endless amount of growth opportunities. In addition, the consistency of intervention, into the home, school, community, provide a well-rounded intervention application that sets the student up for not only a successful educational career but also a successful life.

References

American Psychological Association. (2013). Autism Spectrum Disorder. Retrieved from https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=14&ved=2ahUKEwiYpaLAhP7hAhVomuAKHU4EDQMQFjANegQIBBAC&url=https://www.psychiatry.org/File Library/Psychiatrists/Practice/DSM/APA_DSM-5-Autism-Spectrum-Disorder.pdf&usg=AOvVaw3X2R_mnICR-jhtt

Autism Spectrum Disorder: Overview. (n.d.). Retrieved from https://www.asha.org/Practice-Portal/Clinical-Topics/Autism/

Abshirini M, Khafaie MA, Bahrani MR, Rayshahri AP, Khafaie B. (2016). TEACCH and SIT Approach Program in Children with Autism Spectrum Disorders. *Online J Health Allied Sciences,* 15(3):4.

Binger, C., Kent-Walsh, J., & King, M. (2017). Dynamic Assessment for 3- and 4-Year-Old Children Who Use Augmentative and Alternative Communication: Evaluating Expressive Syntax. *Journal of Speech, Language, and Hearing Research*, *60*(7), 1946–1958. doi: 10.1044/2017_jslhr-l-15-0269

Brodhead, M. T., Higbee, T. S., Pollard, J. S., Akers, J. S., & Gerencser, K. R. (2014). The use of linked activity schedules to teach children with autism to play hide-and-seek. *Journal of Applied Behavior Analysis*, *47*(3), 645–650. doi: 10.1002/jaba.145

Children's Hospital. (2014, March 31). Applied Behavior Analysis (ABA) for Children With Autism. Retrieved from https://www.chop.edu/health-resources/applied-behavior-analysis-aba-children-autism.

Chu, S.-Y. (2016). In. *International Journal of Early Years Education*, *24*(1), 80–96. doi: 10.1080/09669760.2015.1135106

Chung, K.-M., Reavis, S., Mosconi, M., Drewry, J., Matthews, T., & Tassé, M. J. (2007). Peer-mediated social skills training program for young children with high-functioning autism. *Research in Developmental Disabilities*, *28*(4), 423–436. doi: 10.1016/j.ridd.2006.05.002

D'Elia, L., Valeri, G., Sonnino, F., Fontana, I., Mammone, A., & Vicari, S. (2013). A Longitudinal Study of the Teacch Program in Different Settings: The Potential Benefits of Low Intensity Intervention in Preschool Children with Autism Spectrum Disorder. *Journal of Autism and Developmental Disorders*, *44*(3), 615–626. doi: 10.1007/s10803-013-1911-y

Dillenburger, K., Keenan, M., Doherty, A., Byrne, T., & Gallagher, S. (2012). ABA-Based Programs for Children Diagnosed With Autism Spectrum Disorder: Parental and Professional Experiences at School and at Home. *Child & Family Behavior Therapy*, *34*(2), 111–129. doi: 10.1080/07317107.2012.684645

Eikeseth, S., Smith, T., Jahr, E., & Eldevik, S. (2007). Outcome for Children with Autism who Began Intensive Behavioral Treatment Between Ages 4 and 7. *Behavior Modification*, *31*(3), 264–278. doi: 10.1177/0145445506291396

Heflin, L. J., & Simpson, R. L. (1998). Interventions for children and youth with autism: Prudent choices in a world of exaggerated claims and empty promises. Part I: Intervention and treatment option review. Focus on Autism and Other Developmental Disabilities, 13, 194–211.

Hess, K. L., Morrier, M. J., Heflin, L. J., & Ivey, M. L. (2007). Autism Treatment Survey: Services Received by Children with Autism Spectrum Disorders in Public School

Classrooms. *Journal of Autism and Developmental Disorders, 38*(5), 961-971. doi:10.1007/s10803-007-0470-5

Leaf, J. B., Leaf, J. A., Milne, C., Taubman, M., Oppenheim-Leaf, M., Torres, N., … Yoder, P. (2016). An Evaluation of a Behaviorally Based Social Skills Group for Individuals Diagnosed with Autism Spectrum Disorder. *Journal of Autism and Developmental Disorders*, *47*(2), 243–259. doi: 10.1007/s10803-016-2949-4

Licciardello, C. C., Harchik, A. E., & Luiselli, J. K. (2008). *Education and Treatment of Children*, *31*(1), 27–37. doi: 10.1353/etc.0.0010

Lim, H. A., & Draper, E. (2011). The Effects of Music Therapy Incorporated with Applied Behavior Analysis Verbal Behavior Approach for Children with Autism Spectrum Disorders. *Journal of Music Therapy*, *48*(4), 532–550. doi: 10.1093/jmt/48.4.532

Logan, K., Iacono, T., & Trembath, D. (2016). A systematic review of research into aided AAC to increase social-communication functions in children with autism spectrum disorder. *Augmentative and Alternative Communication*, *33*(1), 51–64. doi: 10.1080/07434618.2016.1267795

Mahapatra, S., Vyshedsky, D., Martinez, S., Kannel, B., Braverman, J., Edelson, S. M., & Vyshedskiy, A. (2018). Autism Treatment Evaluation Checklist (ATEC) Norms: A "Growth Chart" for ATEC Score Changes as a Function of Age. *Children (Basel, Switzerland)*, *5*(2), 25. doi:10.3390/children5020025

Maich, K., Hall, C., van Rhijn, T., & Squires, K. (2018). Investigating Stay, Play, & Talk: A Peer-Mediated Social Skills Intervention for Young Children with Autism Spectrum Disorder and Other Social Challenges. *Exceptionality Education International*, *28*(2), 82–104. Retrieved from

http://search.ebscohost.com.libproxy.lib.unc.edu/login.aspx?direct=true&db=eft&AN=133693480&site=ehost-live&scope=site

Meeks, J. H. (2017). Using an Apple iPad and Communication Application to Increase Communication in Students with Autism Spectrum Disorder. *Georgia Educational Researcher*, *14*(1). doi: 10.20429/ger.2017.140106

Mesibov, G. B., & Shea, V. (2009). The TEACCH Program in the Era of Evidence-Based Practice. *Journal of Autism and Developmental Disorders*, *40*(5), 570–579. doi: 10.1007/s10803-009-0901-6

Orellana, L. M., Martínez-Sanchis, S., & Silvestre, F. J. (2013). Training Adults and Children with an Autism Spectrum Disorder to be Compliant with a Clinical Dental Assessment Using a TEACCH-Based Approach. *Journal of Autism and Developmental Disorders*, *44*(4), 776–785. doi: 10.1007/s10803-013-1930-8

Pierce, J. M., Spriggs, A. D., Gast, D. L., & Luscre, D. (2013). Effects of Visual Activity Schedules on Independent Classroom Transitions for Students with Autism. *International Journal of Disability, Development and Education*, *60*(3), 253–269. doi: 10.1080/1034912x.2013.812191

Signs and Symptoms of Autism Spectrum Disorders. (n.d.). CDC. Retrieved from https://www.cdc.gov/ncbddd/autism/signs.html

Shirian, S. A., & Dera, H. A. (2015). Descriptive characteristics of children with autism at Autism Treatment Center, KSA. *Physiology & Behavior*, *151*, 604–608. doi: 10.1016/j.physbeh.2015.09.001

Spriggs, Amy D.; van Dijk, Wilhelmina; and Mims, Pamela J.. 2015. How to Implement Visual Activity Schedules for Students with Disabilities. DADD Online Journal: *Research to*

Practice. Vol.2 21-34. http://daddcec.org/Portals/0/CEC/Autism_Disabilities/Research/Publications/dec2_2015%20DOJ_2.pdf ISSN: 2377-3677

Stahmer, A. C., Collings, N. M., & Palinkas, L. A. (2005). Early Intervention Practices for Children With Autism: Descriptions From Community Providers. *Focus on Autism and Other Developmental Disabilities, 20*(2), 66-79. doi:10.1177/10883576050200020301

Stock, R., Mirenda, P., & Smith, I. M. (2013). Comparison of community-based verbal behavior and pivotal response treatment programs for young children with autism spectrum disorder. *Research in Autism Spectrum Disorders*, *7*(9), 1168–1181. doi: 10.1016/j.rasd.2013.06.002